

Q13: (a)-For the circuit in Figure (13), determine the maximum frequency of the clock signal for reliable operation if the set-up time for each flip-flop is 2 ns and the propagation delays (t_{PLH} and t_{PHL}) from clock to output are 5 ns for each flip-flop.

(b)- For the circuit of part (a), develop a timing diagram for eight clock pulses, showing the Q_A and Q_B outputs in relation to the clock.

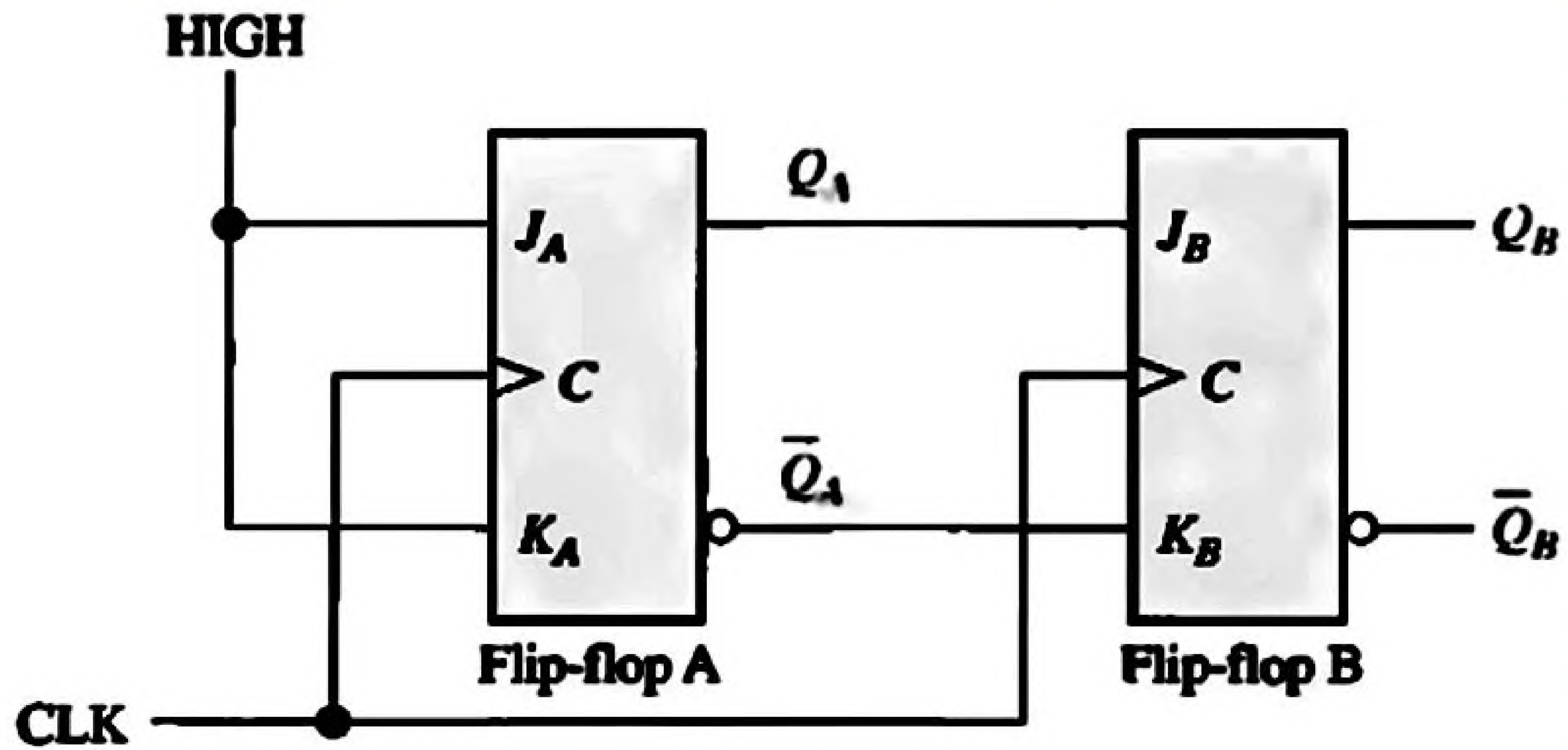


Figure (13)

Q14: (a)-Determine the pulse width of a 74121 one-shot if the external resistor is $3.3 \text{ k}\Omega$ and the external capacitor is 2000 pF .

(b)-An output pulse of $5 \text{ }\mu\text{s}$ duration is to be generated by a 74LS122 one-shot. Using a capacitor of $10,000 \text{ pF}$, determine the value of external resistance required.

Q15: The direct current required by a particular flip-flop that operates on a +5V dc source is found to be 10 mA. A certain digital device uses 15 of these flip-flops. Determine the current capacity required for the +5 V dc supply and the total power dissipation of the system.